Unit 4: The Study of Living Systems

Unit reference number: H/600/5950
QCF level: 1
Credit value: 4
Guided learning hours: 40

Unit aim

This unit will develop learners' knowledge of basic cell structure and homeostasis. They will also study human interaction with the environment and the role of genes in inheritance.

Unit introduction

It is important that learners studying an applied science programme have a good knowledge of the basic concepts of biology that they can develop, and use, in a variety of applications.

This unit will enable learners to develop their biology practical skills and their underpinning knowledge and understanding of biology, including applications in the workplace and effects on the environment and society. The knowledge and skills developed are essential for technicians and assistant practitioners working in biology, healthcare, food science, agriculture, horticulture, beauty therapy and other biology-related industries and laboratory services.

It is important during the delivery and assessment of this unit that learners take on the role of (or work towards) being employed within the biology sector or within organisations that use biology.

Learners will investigate how body systems respond to internal and external environmental changes, using hormonal and nervous signals to maintain the body processes. Learners will gain an appreciation of how living organisms interact with each other and their surroundings. They will also gain an awareness of how organisms adapt to their environment.

Essential resources

Learners should have access to a range of biology resources, similar to those used for GCSE Science. Learners will also need access to a biology/science laboratory.

Access to a range of information resources to complete investigative assignments and case studies is essential, including relevant CD ROMs and the internet.

Learning outcomes and assessment criteria

In order to pass this unit, the evidence that the learners present for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria determine the standard required to achieve the unit.

On completion of this unit learners should:

Learning outcomes		Assessment criteria		Unit amplification
1	Know that cells are the building blocks of life which form tissues and carry out vital functions	1.1	identify major organelles of eukaryotic cells	*Cells*: major organelles of eukaryotic cells; nucleus, cytoplasm, cell membrane *Specialised cells*: red blood cells; nerve; sperm
		1.2	describe the role of the nervous system in homeostasis	*Homeostasis*: nervous system; endocrine system; feedback mechanisms; response to internal and external stimuli
		1.3	describe the role of the endocrine system in homeostasis	
2	Know the interactions within environments	2.1	describe components of an ecosystem	*Ecosystems*: definitions; habitat; population; community; species; food webs; food chains
		2.2	explain adaptations in ecosystems	*Adaptations*: evolution; environment, e.g. deserts, cold regions, volcanic environment; competition, e.g. food, space, predator and prey relationships
		2.3	describe the effects of humans on ecosystems	*Effects of humans on ecosystems*: e.g. pesticides and insecticides on plants and animals, carbon emissions, human population, acid rain; living and non-living indicator assessment

Learning outcomes		Assessment criteria		Unit amplification
3	Know the role of genes in inheritance and variation	3.1	describe the role of genes in inheritance	*Inheritance*: genes; chromosomes; allele; dominant recessive; mutations causing variations that lead to evolutionary change *Human health*: inherited diseases, e.g. Huntingdon's chorea, haemophilia, cystic fibrosis
		3.2	describe the role of genes in variation	*Variation*: height; eye colour; sex

Information for tutors

Delivery

This unit can be delivered through a programme of tuition and practical investigative work. This will enable learners to develop skills and learn the fundamental concepts needed to develop further in the biological sciences sector.

In learning outcome 1 learners study the structure of cells. Where possible, this should be carried out practically by observing cell slides under microscopes and making illustrations of observations. Learners should be able to compare and contrast different cells and recognise that these differences may show distinct characteristics by which cells may be distinguished or grouped together. Learners need only be familiar with the term 'cells with a nucleus' (not 'eukaryotic').

Learners also need to be familiar with the term 'homeostasis' and the role of the nervous and endocrine systems in maintaining a balanced internal environment.

Learning outcome 2 enables learners to explore ecosystems and living things in their environment, for example how animals can adapt to their environment. Learners will also study how human activity can effect and change the environment. This learning outcome could be delivered through relevant field trips.

Learning outcome 3 covers inheritance and the function of chromosomes and genes. Learners will study how mutations can influence the development of an organism, leading to evolutionary change. For example, the growth in numbers of the melanic form of peppered moth *Biston Betularia* in the industrial north of England towards the end of the nineteenth century. Learning outcome 3 also covers the effects of inheritance on human health and the role of genes in human variation.

Learners can carry out a number of formative developmental activities including:

- the structure and function of cells and specialised cells
- the role of the nervous and endocrine systems in homeostasis
- ecosystems and their dynamics
- the adaptations of animals
- predator and prey relationships
- the impact of human activity on ecosystems and their inhabitants
- the effects of human activity on the environment
- genes and their functions
- variations – continuous and discontinuous
- environmental variations.

Assessment

The centre will devise and mark the assessment for this unit.

Learners must meet all assessment criteria to pass the unit.

Assessment evidence can be generated through a variety of means, for example the use of scientific investigative reports, presentations, posters, graphs, charts, photographs.

For learning outcome 1, learners must identify the major organelles of eukaryotic cells. Evidence could be generated via a report or a presentation. Learners would not be expected to know the terminology 'eukaryotic'.

Learners also need to be familiar with the term 'homeostasis' and need to describe the role of the nervous and endocrine systems in maintaining a constant internal environment.

For learning outcome 2, learners must describe the different components of an ecosystem. They need to explain adaptations in ecosystems, providing evidence and/or examples to support their views. Learners also need to describe the effects of humans on ecosystems. This could be evidenced through practical investigations, reports or question and answer sessions with the assessor. Field trips and accompanying notes are also highly recommended.

For learning outcome 3, learners must describe the role of genes in inheritance and variation. The evidence for this could be an investigation into the role of genes, with learners producing assessment evidence in the form of a report or presentation.

Suggested resources

Books

Goodfellow D, Hocking S and Musa I - *BTEC First Principles of Applied Science Student Book* (Pearson Education, 2012) ISBN 9781446902790

Levesley M, Johnson P, Jones M, Chapman C - *Edexcel GCSE Science : GCSE Science Student Book* (Pearson Education, 2011) ISBN 9781846908897

Twenty First Century Science: *GCSE Biology Workbook* (Oxford University Press, 2012) ISBN 9780199138364

Journals

Focus

New Scientist

Websites

BBC – GCSE Bitesize	www.bbc.co.uk/schools/gcsebitesize/science
Focus Educational Software Ltd	www.focuseducational.com
Genetic Alliance UK	www.gig.org.uk
The Association for Science Education	www.ase.org.uk
The Environment Agency	www.environment-agency.gov.uk
Teens Health – Basics on Genes and Genetic Disorders	http://kidshealth.org/teen/your_body/health_basics/genes_genetic_disorders.html